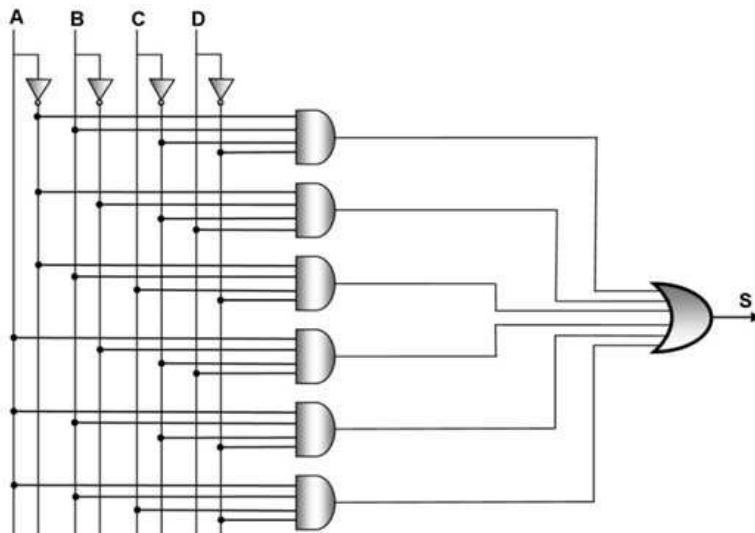


1.1 Exercises for admission exam in University of Basque Country - UPV-EHU (2010-2012)

Exercise 1

Having into account the circuit in the Figure, you have to reason the following steps:

- Logic function equation. (0,5 points)
- Karnaugh map. (0,5 points)
- Obtain the simplified function. (0,5 points)
- Represent the circuit with the minimum number of possible gates. (0,5 points)



Exercise 2

The control of an engine is regulated by a digital system composed of 4 switches (A, B, C and D) fulfilling the following conditions.

The engine works:

- When only the switch A is activated.
- When only the switch C or D is deactivated.
- When only the switches A and B are activated.
- When the four switches are activated.

Reasoning all the steps, you have to obtain:

- The truth table for the engine control system. (1 point)
- The Karnaugh map. (0,5 points)
- The minimized logic function. (0,5 points)
- The logic electronic circuit for the minimized function that controls the engine. (0,5 points)

Exercise 3

The system that controls the light in a building corridor is automatically regulated by a system composed of:

- Two movement sensors (a and b) placed in each of the borders of the corridor.
- A light sensor (c) placed in the centre of the corridor.
- A manual switch (d) placed in the control cabin.

The corridor light is switched on in the following cases:

- I. When the manual switch (d) is activated, independently of the situation of the remaining elements.
- II. When the light sensor (c) (insufficient light) is activated and, at least one of the movement sensors (a and b) are activated.

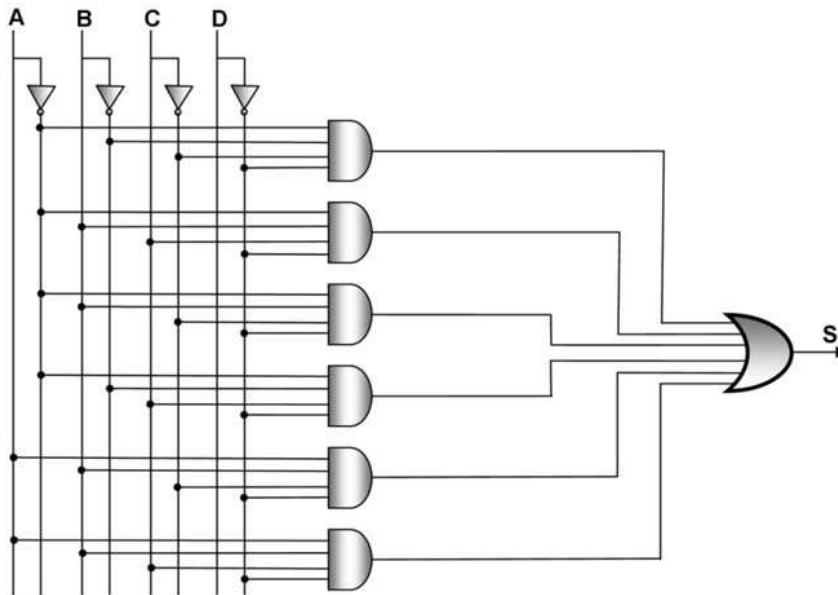
Reasoning all these steps, generate the following:

- 1) The truth table of the light control system. *(1 point)*
- 2) The Karnaugh map. *(0,5 points)*
- 3) The minimized logic function. *(0,5 points)*
- 4) The electronic logic circuit of the minimized function that controls the light system. *(0,5 points)*

Exercise 4

Having into account the Figure's circuit, you have to perform and reason the following:

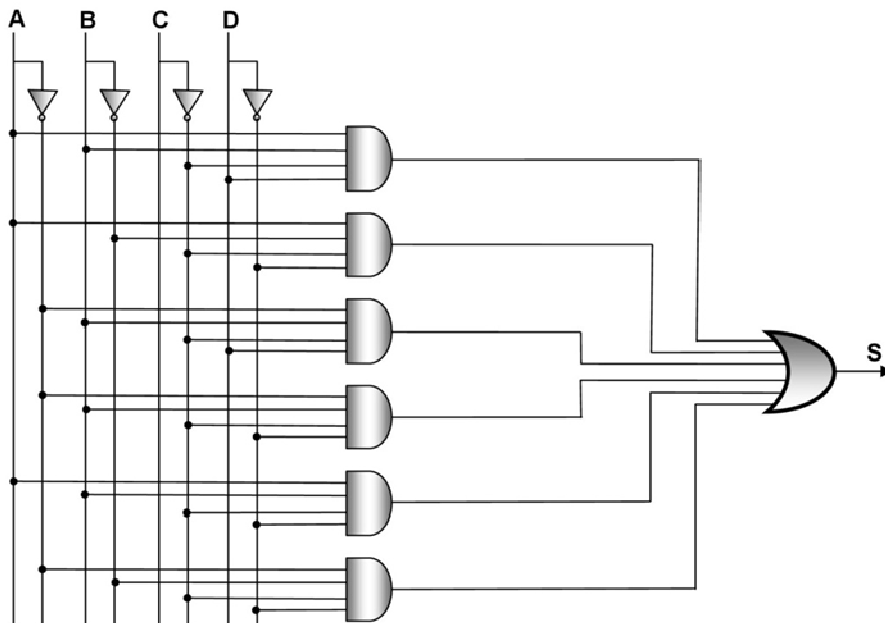
- a) Logic function equation. *(0,5 points)*
- b) Karnaugh map. *(0,5 points)*
- c) Obtain the minimized function. *(1 point)*
- d) Represent the new circuit with the minimum number of gates possible. *(0,5 points)*



Exercise 5

Having into account the circuit in the Figure, you have to reason about the following steps:

- a) Logic function logic. *(0,5 points)*
- b) Karnaugh map. *(0,5 points)*
- c) Obtain the minimized function. *(1 point)*
- d) Represent the circuit again with the minimum number of possible gates. *(0,5 points)*



Exercise 6

The opening system of a security door is automatically regulated by a system composed of:

1. A switch (a) placed in the door
2. Two switches (b and c) placed in the door
3. A switch (d) placed in the control cabin

The gate is opened in the following cases

- a) When the switch is activated (a) and at least one of the switches placed in the gate (b) and (c)
- b) When the switch (a) is activated and the (d) switch is placed in the cabin control, independently of the situation of the remaining system elements.

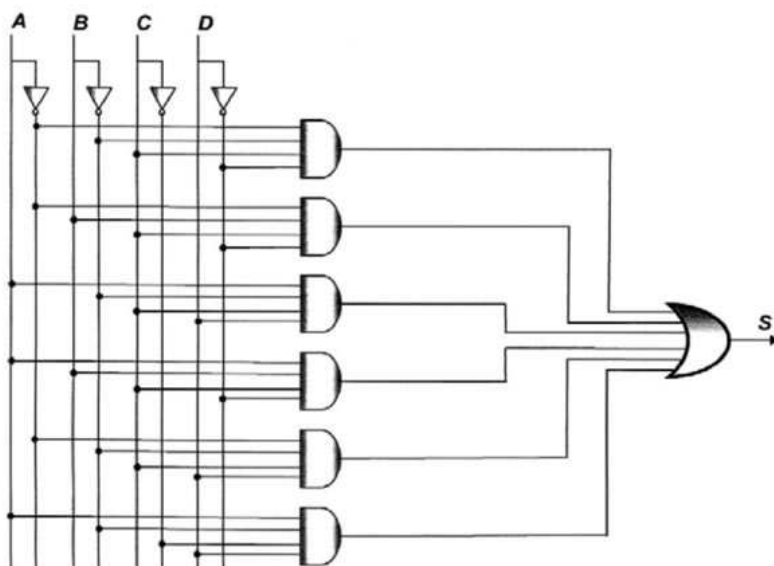
Reasoning about all those steps, you have to obtain:

- a) The truth table for the door opening system (1 point)
- b) The Karnaugh map (0,5 points)
- c) The minimized logic function (0,5 points)
- d) The electronic logic circuit for the minimized function that controls the opening system of the security door. (0,5 points)

Exercise 7

Having into account the circuit of the Figure, you have to obtain the following:

- a) Logic function equation. (1 point)
- b) Karnaugh map. (1,5 points)
- c) Obtain the minimized function. (1,5 point)
- d) Represent again the circuit with the minimum number of possible gates. (1 point)



Exercise 8

The control of a press is formed by a digital system composed of 4 switches (A, B, C, and D), fulfilling the following conditions:

The press works:

- When only the switches A and B are activated
- When only the switches A and C are activated
- When the switches A and D are activated independently of the position of the remaining switches.

Reasoning about all the steps, you have to obtain:

- a) The truth table of the system. *(1,5 points)*
- b) The Karnaugh map. *(1 point)*
- c) The minimum minimized equation of the output (press functioning). *(1,5 points)*
- d) The logic electronic circuit that controls the press functioning. *(1 point)*